

## CLAIMS

What is claimed is:

- 1 1. An apparatus comprising:  
2 a contact on a substrate;  
3 a dielectric material overlying the contact;  
4 a phase change element overlying the dielectric material on a substrate;  
5 and  
6 a heater element disposed in the dielectric material and coupled to the  
7 contact and the phase change element,  
8 wherein a portion of the dielectric material comprises a thermal  
9 conductivity less than silicon dioxide.
- 1 2. The apparatus of claim 1, wherein the portion of the dielectric material is  
2 adjacent the heater element.
- 1 3. The apparatus of claim 2, wherein the heater element has a first portion  
2 and a second portion and the second portion is disposed adjacent the phase  
3 change element, wherein the portion of the dielectric material is adjacent the  
4 second portion of the heater element.
- 1 4. The apparatus of claim 2, wherein the heater element comprises a body  
2 surrounded in all directions by the dielectric material, the body defining, by a  
3 cross-section through the body, volumes of dielectric material:  
4 a first volume adjacent a left side of the body;  
5 a second volume adjacent a right side of the body;  
6 a third volume adjacent a front side of the body; and  
7 a fourth volume adjacent a back side of the body,  
8 wherein the portion of the dielectric material comprises one of the first  
9 volume, the second volume, the third volume, and the fourth volume.
- 1 5. The apparatus of claim 4, wherein the heater element has a first portion  
2 and a second portion and the second portion is disposed adjacent the phase  
3 change element, wherein the portion of the dielectric material is adjacent the  
4 second portion of the heater element.



1 6. The apparatus of claim 5, wherein the portion of the dielectric material  
2 comprises more than one of the first volume, the second volume, the third  
3 volume, and the fourth volume.

1 7. The apparatus of claim 1, wherein the dimensions of the phase change  
2 element define an area over the dielectric material, and the portion of the  
3 dielectric material is within a volume comprising the area.

1 8. The apparatus of claim 7, wherein the portion of dielectric material  
2 comprises the entire area.

1 9. The apparatus of claim 1, wherein the thermal conductivity is three to 10  
2 times less than silicon dioxide.

1 10. The apparatus of claim 1, wherein the dielectric material comprises  
2 Xerogel.

1 11. An apparatus comprising:  
2 a contact on a substrate;  
3 a dielectric material overlying the contact;  
4 a chalcogenide memory element overlying the dielectric material on a  
5 substrate; and  
6 a heater element disposed in the dielectric material and coupled to the  
7 contact and the chalcogenide memory element,  
8 wherein a portion of the dielectric material comprises a thermal conductivity less  
9 than silicon dioxide.

1 12. The apparatus of claim 11, wherein the portion of the dielectric material is  
2 adjacent the heater element.

1 13. The apparatus of claim 11, wherein the heater element comprises a body  
2 surrounded in all directions by the dielectric material, the body defining, by a  
3 cross-section through the body, volumes of dielectric material:  
4 a first volume adjacent a left side of the body;  
5 a second volume adjacent a right side of the body;  
6 a third volume adjacent a front side of the body; and



7 a fourth volume adjacent a back side of the body,  
8 wherein the portion of the dielectric material comprises one of the first  
9 volume, the second volume, the third volume, and the fourth volume.

1 14. The apparatus of claim 13, wherein the heater element has a first portion  
2 and a second portion and the second portion is disposed adjacent the phase  
3 change element, wherein the portion of the dielectric material is adjacent the  
4 second portion of the heater element.

1 15. The apparatus of claim 14, wherein the portion of the dielectric material  
2 comprises more than one of the first volume, the second volume, the third  
3 volume, and the fourth volume.

1 16. The apparatus of claim 11, wherein the portion of the dielectric material  
2 has a thermal conductivity that is three to 10 times less than silicon dioxide.

1 17. The apparatus of claim 11, wherein the portion of the dielectric material  
2 comprises Xerogel.

1 18. A method comprising:  
2 introducing over a contact formed on a substrate, a dielectric material, a  
3 portion of which comprises a thermal conductivity less than silicon dioxide;  
4 introducing a heater element through the dielectric material to the contact;  
5 and  
6 introducing a phase change material over the dielectric material and the  
7 heater element.

1 19. The method of claim 18, wherein introducing the dielectric material  
2 comprises introducing the portion which comprises the thermal conductivity less  
3 than silicon dioxide adjacent the heater element.

1 20. The method of claim 18, wherein the heater element comprises a body and  
2 introducing the dielectric comprises surrounding the body of the heater element  
3 in all directions by the dielectric material, the body defining, by a cross-section  
4 through the body, volumes of dielectric material:  
5 a first volume adjacent a left side of the body;  
6 a second volume adjacent a right side of the body;



7 a third volume adjacent a front side of the body; and  
8 a fourth volume adjacent a back side of the body, and  
9 the portion of the dielectric material comprises one of the first volume, the  
10 second volume, the third volume, and the fourth volume.

1 21. The method of claim 20, wherein the heater element has a first portion and  
2 a second portion and the second portion is disposed adjacent the phase change  
3 element and introducing the dielectric material comprises introducing the  
4 portion with the thermal conductivity less than silicon dioxide adjacent the  
5 second portion of the heater element.

1 22. The method of claim 21, wherein introducing the dielectric material  
2 comprises introducing the portion of the thermal conductivity less than silicon  
3 dioxide within more than one of the first volume, the second volume, the third  
4 volume, and the fourth volume.